Session 5A: Probabilistic Surveys: Update of Regional Activities
March 19, 2008

Analysis of Wadeable Stream Survey Data from Region V: Effects of Spatial Survey Design on Estimates of Biological Condition and Stressor Awareness

Yoder, Chris O., Miltner, Robert J.[1], and Rankin, Edward T.[2]
Center for Applied Bioassessment and Biocriteria, Midwest Biodiversity Institute, P.O. Box 21561, Columbus, OH 43221-0561; phone: (614) 403-9592; fax: (614) 457-6005; email: yoder@rrohio.com

Key Words: wadeable streams, ecological condition, probability design, bioassessment

Abstract: Spatial survey design is a critical yet frequently under-rated aspect of designing and conducting assessments of overall biological condition. We present here some of the survey designs employed by U.S. EPA and selected state water quality agencies for determining biological condition and the stressors that are associated with that condition. During 2004-5 we sampled within the six states in EPA Region V (IL, IN, MI, MN, OH, and WI) as part of the National Wadeable Streams Assessment (WSA). Biologically-based condition estimates produced by the WSA probability survey design were not substantially different than that produced by 5 of the 6 states each using different spatial survey designs. Three of these states employ targeted sampling of sites that are allocated at a spatial scale approximating an 8-digit HUC watershed, two states employ an intensive watershed design at an 11-digit HUC watershed scale, and the remaining state employed a statewide probability design. There are differences in what the baseline spatial scale of monitoring can support in terms of bioassessment outcomes, in particular the detail of the biological condition gradient that can be expressed and measured, i.e., multiple categories of condition vs. a bivariate pass/fail result. Bioassessments that are based on and which employ a more spatially detailed survey design seem to be able to define condition in multiple categories and provide more detailed feedback about stressor effects. This was illustrated for results from the WSA and the Ohio geometric sampling design for one common pollutant, ammonia-nitrogen. The latter produced a more complete stress:response gradient than did the larger scale sample yielded by the WSA. We deduce that this is due to the ability of the geometric design to actually measure varying pollution gradients that exist in varying shapes within individual small streams and watersheds. Spatial density of sampling sites is the important phenomenon that is illustrated by this particular example.

Notes:

[1] Ohio EPA, Ecological Assessment Section, 1685 Homer Ohio Lane, Groveport, OH 43228
[2] Ohio University, Voinovich School for Leadership & Public Affairs, The Ridges, Athens, OH 45701